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SUBJECT North East Papanui Development – Water
 Supply Assessment

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1 Introduction

Opus International Consultants was commissioned by Christchurch City Council (CCC) to assess submissions received by CCC requesting rezoning of properties in the North East Papanui development from Rural 3 to RNN, RNN constrained, and RMD. There were six areas of assessment based on the submissions received (refer Table 1). Each of these submissions have been assessed for the potential impact to the wastewater and water network.

This memo will specifically address the impact to the water network.

The data supplied by Christchurch City Council (CCC) for use during the assessment includes:

- Revised map showing the outline of the development plan for NE Papanui Development
- Estimate of property yields for the new developments. The estimate of property yields includes a maximum number based on allowable maximum density and a reduced number based on assuming 30% of the land is used by up roading, swales and reserves.

2 Estimated Households

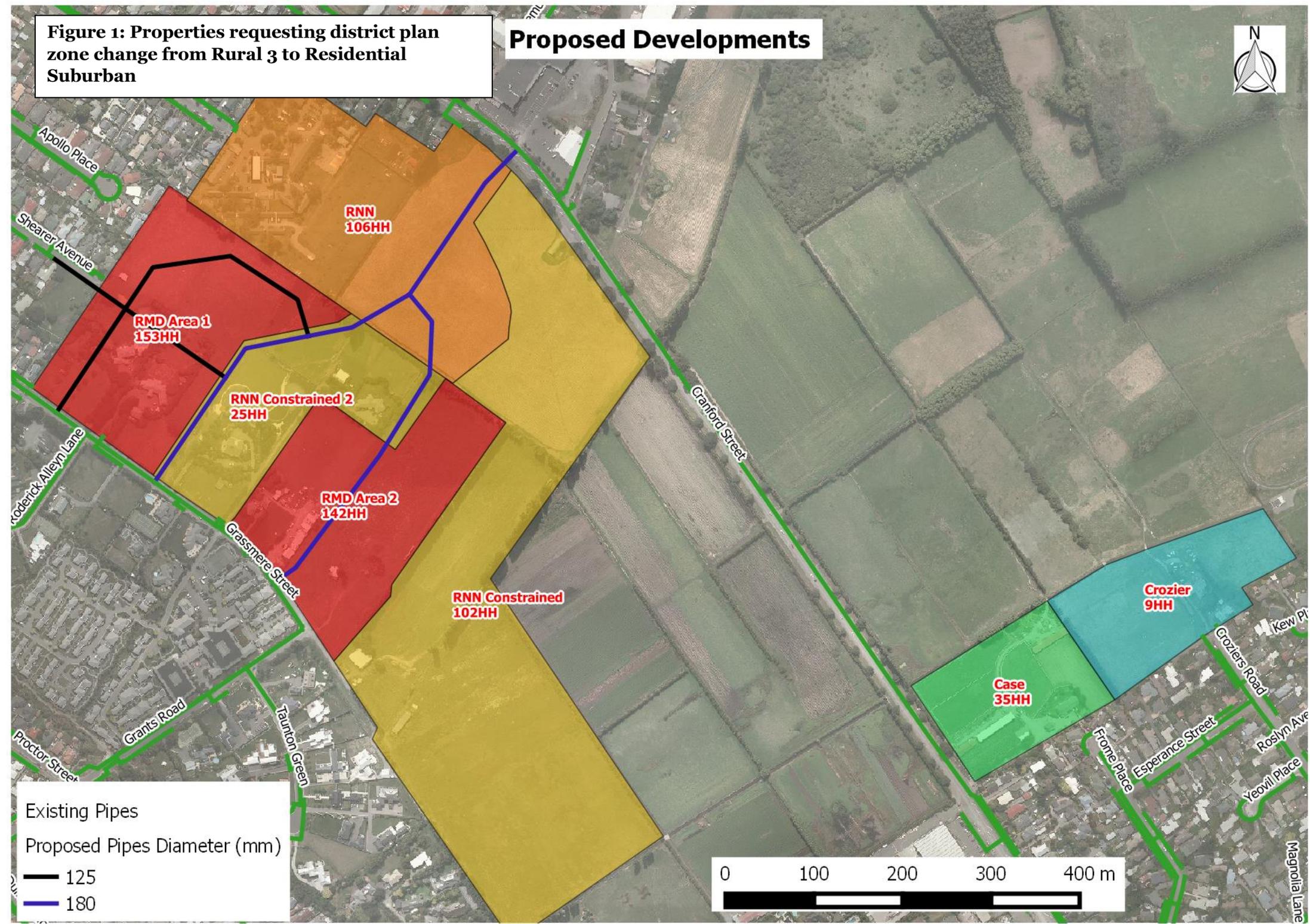
CCC has provided the following development changes to analyse for the water supply impact (Table 1 and Figure 1):

Table 1: Submissions Requesting District Plan Review

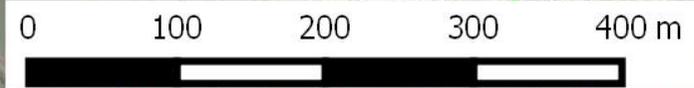
Development	Area (ha)	Allotments/ha	Maximum Households	Reduced Households
RNN	7.0720	15	106	74
RMD Area 2	4.7625	30	142	100
RMD Area 1	5.1109	30	153	107
RNN Constrained	12.7779	8	102	71
RNN Constrained 2	3.1732	8	25	18
Case			35	30
Crozier			9	9

Figure 1: Properties requesting district plan zone change from Rural 3 to Residential Suburban

Proposed Developments



Existing Pipes
Proposed Pipes Diameter (mm)
— 125
— 180



3 Assessment Approach

In order to assess the impact of the proposed submissions on the water network, the following methodology was undertaken:

1. The maximum households yield provided by CCC was used for the number of new connections. If the analysis indicated problems supplying the maximum yield, then the reduced yield would also be analysed.
2. Demand for the new connections was based on demand for other properties within the Saint Albans Zone. Demand for existing customers in the surrounding area was 1,859 L/d on average for the peak day. Demand applied to new connections was 20% higher than for existing customers to provide a slightly conservative demand estimation. The demand applied to new connections was 2,230 L/d.
3. New DN 125 and DN180 PE pipelines were added through the development (Figure 1).

4 Assumptions

We have made the following assumptions during this investigation:

1. The Averill pump station will be rebuilt with similar or improved pumping capacity as pre-earthquake (pre-earthquake capacity 273 m³/hr). The pump station is programmed for construction the 2024/25 financial year.
2. The proposed rezoning of the Christchurch water supply is carried out, which will place the developments in the future Saint Albans water supply zone.
3. The Residential Red Zone areas within the Saint Albans zone will be redeveloped in some form in the future to a similar level of water demand as prior to the earthquakes. This could be any of a range of developments from irrigation of green spaces to housing development.

5 Results and Analysis

5.1 Current Model Results

Flow at hydrants around the new development were compared between the current model and the updated model with the additional demands. A new hydrant was also added in the development to check fire flow availability for the development.

The results (Table 2) show that the hydrant flows have improved with the new development. The total flow from 4 hydrants tested simultaneously was of 89 L/s in the current model, and it increased to 120 L/s with the new development and pipework. This is due to the addition of new pipes through the development which increase the connectivity and allow for more capacity in the area.

The new hydrant in the development provides a flow of 41L/s (Figure 2), which exceeds the required flows of 25 L/s.

Furthermore, minimum pressures at the night time peak are above 50 meters in the development (Figure 3), which exceeds the required pressure of 30 meters.

However, the system is being maintained by drawing large flows from the Central City and southern Central Zone pump stations, and is draining the Huntsbury reservoir rapidly, to make up for a lack of capacity in the Saint Albans area.

The Averill pump station is planned for replacement by 2024/25, and is likely to be operational by 2026. The timeframe of the Averill replacement is substantially longer than the timeframe for development of North East Papanui. The Averill pump station has not been used in the current operation scenarios.

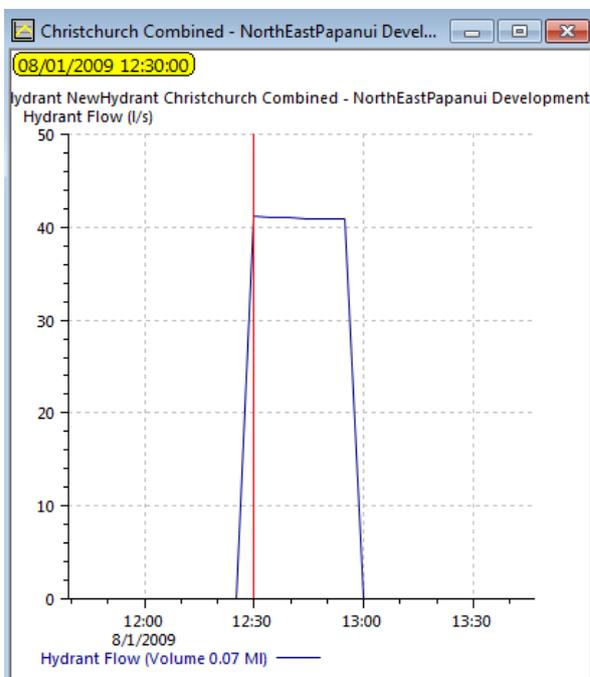


Figure 2 - Hydrant Flow in the Development before Rezoning

Table 2 - Hydrant Flows before the Rezoning

	Pre Development	Post Development
Hydrant ID	Flow (L/s)	Flow (L/s)
WsHydrantID14100	21.6	29.2
WsHydrantID14735	22.6	30.4
WsHydrantID14736	23.0	30.8
WsHydrantID9822	22.0	29.6
Total (North)	89.2	120.1
NewHydrant	N/A	41.1



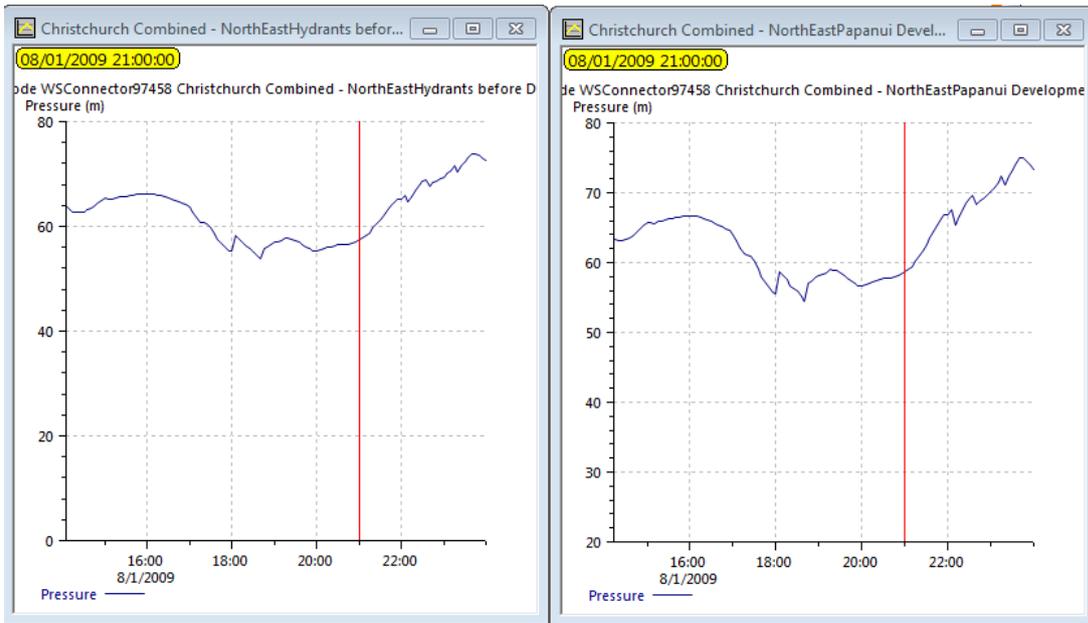


Figure 3 - Pressure near the development before the development (left) and after (right)

5.2 Rezoning Model Results

Hydrant flows around the development were also analysed in the Christchurch rezoning model. The Rezoning model was based on set pressures at the pump stations of 500 kPa, and the final set pressure may be higher than 500 kPa.

The same four hydrants were tested simultaneously in the vicinity of the development. The total fire flow available is found to be 113 L/s (Table 3).

The new hydrant in the development provides a fire flow of 36 L/s (Figure 4), and pressures in the development are above 40 meters (Figure 5).



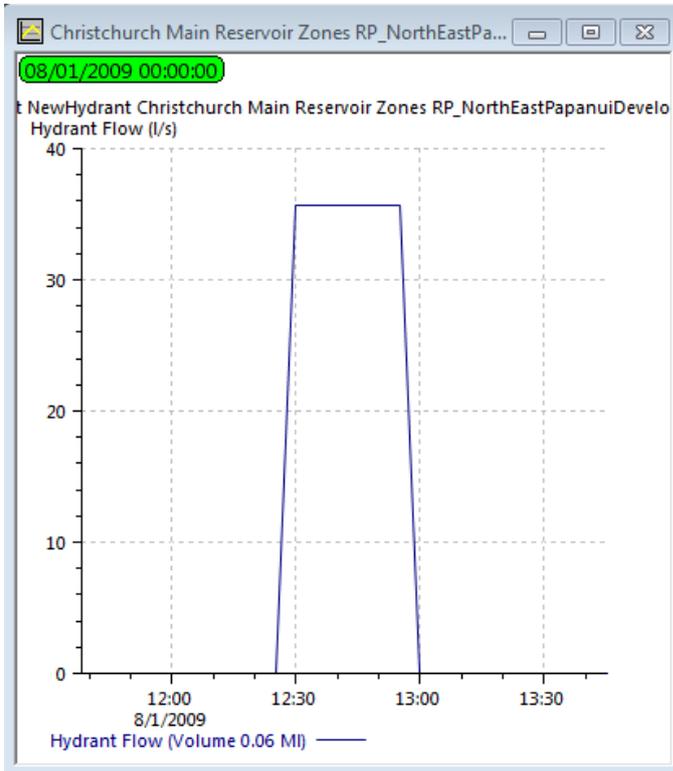


Figure 4 - Hydrant Flow in the Development after Rezoning

Table 3 - Hydrant Flows after the Rezoning

	Rezoning
Hydrant ID	Flow (L/s)
WsHydrantID14100	27.6
WsHydrantID14735	28.7
WsHydrantID14736	29.0
WsHydrantID9822	28.0
Total (North)	113.3
NewHydrant	35.7



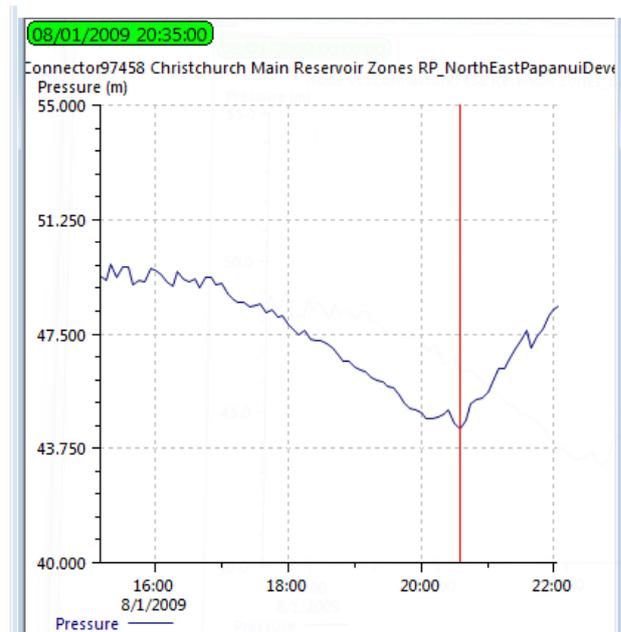
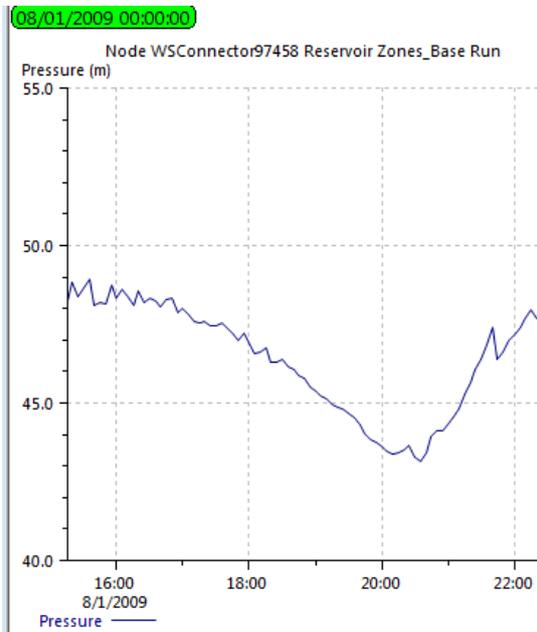


Figure 5 - Pressure near the development before the development (left) and after (right) - after Rezoning

The Averill pump station has been assumed in the Rezoning model to be upgraded to a flow of 100 L/s (360 m³/hr). With the upgrade, the Saint Albans Zone is able to meet the pressures within the zone without excessive flows out of any pump station.

The model was also tested without the Averill pump station. The pressure in the vicinity of the development is still above 40 meters at the evening peak (Figure 6). However, the flow in several of the pump stations is substantially above the nominal capacity of the stations, and risks suction tanks running empty at several sites within the St Albans zone. In particular, the Montreal and Hills pump stations are operating with flows approximately 30% greater than the well capacity. We recommend a replacement Averill pump station is in place prior to the rezoning of the Saint Albans zone.

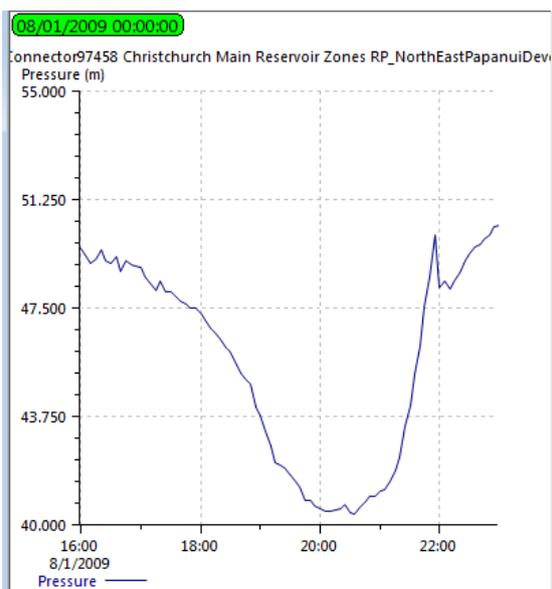


Figure 6 - Pressure near the development after the development with Averill Pump Off - after rezoning



5.3 Summary of Results

No issues were identified with the water supply to the North East Papanui development, provided that the proposed pipework is added through the development, and the Averill pump station capacity is replaced prior to the rezoning of the Saint Albans zone.

There is a general shortage of capacity in the Saint Albans area, which is currently being supplied by drawing heavily on the pump stations in the Central City and south, as well as the Huntsbury reservoir.

Significant issues occur in the Saint Albans zone if a replacement Averill pump station is not installed and the rezoning of the Saint Albans zone is carried out. There are some pump stations running above the nominal capacity of the wells in the pre-rezoning model, but at a much reduced level than after the rezoning if Averill is not replaced.

Hydrant flows analysis showed an increase in fire flow availability in the vicinity of the development, due to improved connectivity after the addition of the new pipework more than compensating for the additional demand on the system. There is currently limited connectivity due to undersized mains between the Grassmere pump station and Cranford Street, and connections to Grassmere Street, Shearer Avenue and Cranford Street through the development help compensate for the undersized mains.

6 Recommendations

We have three recommendations:

1. The development is able to be approved for supply from the Central Zone at present and the Saint Albans Zone after rezoning.
2. Connections are made to Grassmere Street, Shearer Avenue and Cranford Street
3. The Averill pump station is reinstated (not necessarily on the same site) with a capacity of 360-400 m³/hr in the longer term.